



Oracle VM Template for MySQL Enterprise Edition

**Rapidly Deliver Web-Based Applications in the Cloud, with Reduced Risk, Cost
and Complexity**

A MySQL[®] Implementation Guide

June 2011



Table of Contents

Introduction	3
Template Components	4
Oracle Linux	4
Oracle VM	5
Oracle Cluster File System 2 (OCFS2)	6
MySQL 5.5 Enterprise Edition	7
Creation of the Oracle VM Template	7
Deploying the Oracle VM Template	8
Using and Modifying Oracle VM Template	9
Enabling High Availability for the Oracle VM Template	11
Capabilities & Configuration of Oracle VM HA	11
Using the Oracle VM Template for MySQL in Production	13
Oracle Unbreakable Linux Network	14
Reducing Total Cost of Ownership	14
Conclusion	14
Additional Resources	15



Introduction

As organizations increasingly deliver web-based services and as ISVs more broadly offer SaaS/on-demand versions of their software, they face the challenges of a rapidly expanding data center: increased operating costs, inefficient resource utilization and an appetite for real estate. Many are turning to virtualization technologies to provide solutions to these challenges, and enable a cloud infrastructure.

To be fully effective, virtualization and cloud computing solutions must also increase operational agility, enhance service uptime, meet price / performance needs, and make applications easier to deploy, manage, and support.

The Oracle VM Template for MySQL Enterprise Edition has been engineered to address these challenges, helping users to rapidly & safely deploy and manage web and cloud-based MySQL applications, with a lower TCO (Total Cost of Ownership) than other virtualization technologies in the marketplace.

Bringing the benefits of deeper integration with infrastructure software to MySQL users, the Oracle VM Template enables rapid deployment and eliminates manual configuration efforts. It provides a pre-installed and pre-configured virtualized MySQL 5.5 Enterprise Edition software image running on Oracle Linux and Oracle VM, certified for production use. The MySQL software image has undergone extensive integration and quality assurance testing as part of the development process.

Users of the Oracle VM Template for MySQL Enterprise Edition get access to the comprehensive suite of MySQL management tools including MySQL Enterprise Monitor & Query Analyzer, MySQL Enterprise Backup and MySQL Workbench. Moreover, they can have a single point of contact for technical support across all components included in the template, delivered 24/7 globally by Oracle's world-class support organization.

In addition to rapid provisioning, MySQL users also benefit from the integrated high availability features of Oracle VM which are designed to enable organizations to meet stringent SLA (Service Level Agreement) demands through a combination of:

- **Automatic recovery from failures**, with Oracle VM automatically restarting failed instances on available servers in the server pool after outages of the physical server, VM or MySQL database.
- **Live Migration**, enabling operations staff to move running instances of MySQL to alternative hosts within a server pool when they need to perform maintenance operations.

By building MySQL database services using the Oracle VM Template, users benefit from:

- **Faster deployments**, with drastically reduced installation & configuration cycles both for initial deployments and to provision replicated scale-out environments
- **Increased reliability**, using a pre-installed and pre-configured software stack having already undergone extensive quality assurance and certified for production use.
- **Higher uptime**, leveraging virtualization to help reduce outages resulting from failures as well as planned maintenance operations.

This Guide describes the design, implementation and configuration of the Oracle VM Template for MySQL Enterprise Edition, including:

- Template deployment.
- Template customization.
- Enabling high availability.
- Golden Template creation.

As the Guide will demonstrate, integrating MySQL Enterprise Edition with Oracle Linux and Oracle VM, the Oracle VM Template is the fastest, easiest and most reliable way to provision virtualized MySQL instances. IT groups are able to meet the explosive demand for web-based services, while being able to depend on Oracle as a single source of technical support for all components of the stack, at the same time reducing TCO.

Template Components

The Oracle VM Template integrates the following components, each of which are described below:

- Oracle Enterprise Linux 5 Update 6 with the Unbreakable Enterprise Kernel
- Oracle VM 2.2.1
- Oracle VM Manager 2.1.5
- Oracle Cluster File System 2 (OCFS2)
- MySQL Database 5.5.10 (Enterprise Edition)

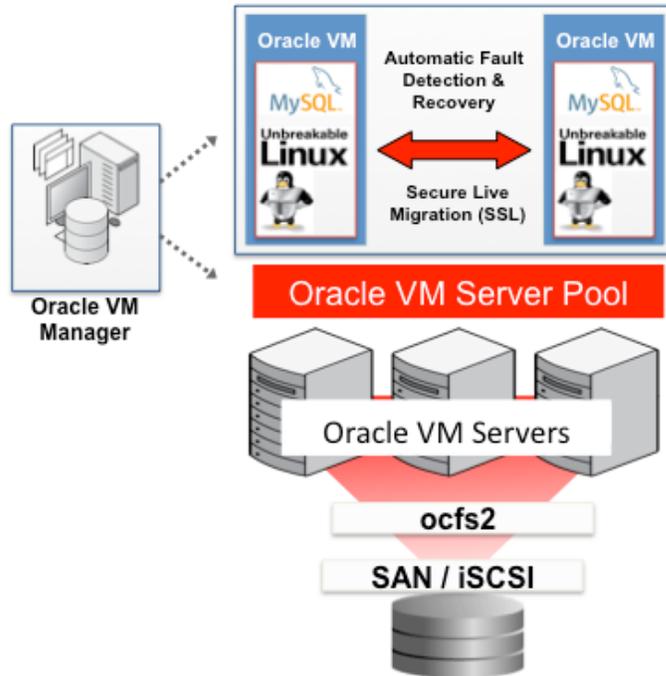


Figure 1: Oracle VM Template for MySQL 5.5 Enterprise Edition, deployed onto a server pool

Oracle Linux

Oracle Linux with the Unbreakable Enterprise Kernel is provided as the operating system within the template.

Available under the GNU General Public License (GPL), Oracle Linux¹ is an enterprise-class Linux distribution developed and supported by Oracle.

Oracle Linux is certified for compliance with the Linux Standard Base (LSB), which increases the compatibility between individual Linux distributions, reducing the costs and effort involved with porting and then supporting applications across different distributions.

Included in Oracle Linux, the Oracle Unbreakable Enterprise Kernel² is based on the stable 2.6.32 Linux kernel, delivering a fast, modern, reliable platform that is optimized for enterprise software and hardware. Oracle Linux combined with the Unbreakable Enterprise Kernel brings the latest Linux innovations to market delivering extreme performance, advanced scalability and reliability for business-critical applications.

¹ <http://www.oracle.com/us/technologies/linux/025994.htm>

² <http://www.oracle.com/us/technologies/linux/unbreakable-enterprise-kernel-ds-173416.pdf>

The Oracle Unbreakable Linux support program³ delivers enterprise-class support for Oracle Linux including the Oracle Unbreakable Enterprise Kernel with premier backports, management packs, indemnification, testing and more.

Oracle VM

Oracle VM⁴ is a free, next generation server virtualization and management solution supporting both Oracle and non-Oracle applications. Oracle VM provides an easy-to-use graphical interface for creating and managing virtual server pools running on x86 and x86-64-based systems across an enterprise; with support for Linux, Solaris and Windows guests. The components of Oracle VM comprise:

- **Oracle VM Server:** A self-contained virtualization environment designed to provide a lightweight, secure, server-based platform for running virtual machines. Oracle VM Server is based upon an updated version of the underlying Xen hypervisor technology, and includes the Oracle VM Agent, which communicates with Oracle VM Manager for the management of virtual machine instances.
- **Oracle VM Manager:** Provides the user interface to manage Oracle VM Servers and is a standard ADF (Application Development Framework) web application. Oracle VM Manager is responsible for virtual machine life-cycle management, including the creation, deletion, powering off, uploading, deploying and live migration of virtual machine images. The Oracle VM Manager also administers resources, including ISO files, virtual machine templates and shared hard disks.

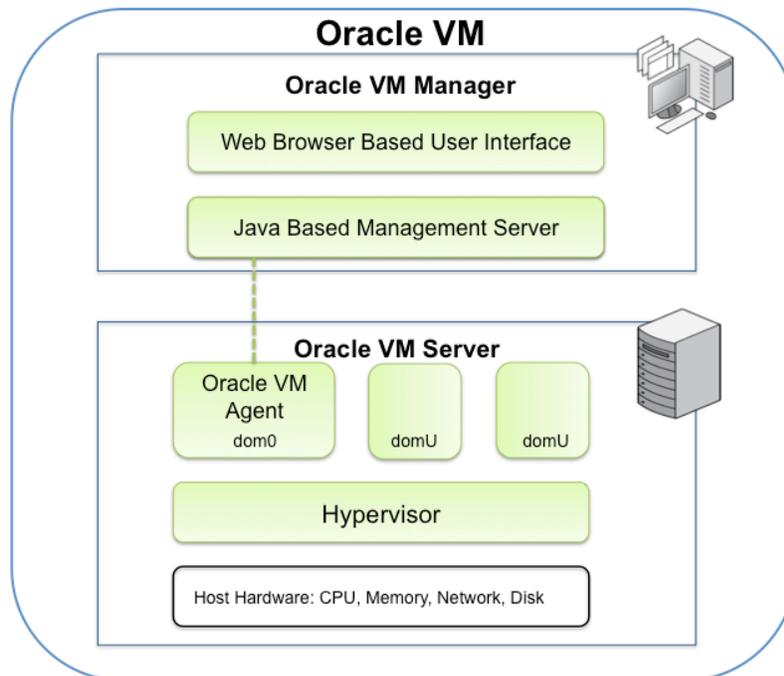


Figure 2: The Oracle VM Architecture

In addition to the proven benefits of virtualization, Oracle VM can also enhance high availability through:

- **Secure Live VM Migration:** Eliminates service outages associated with planned maintenance by migrating running VMs to other servers over secure SSL links, without interruption. Oracle VM is the first major virtualization solution to SSL-encrypt migration traffic by default to protect sensitive data from exploitation. Most migration products don't offer native encryption, creating vulnerabilities, and

³ <http://www.oracle.com/us/technologies/027614.pdf>

⁴ <http://www.oracle.com/us/technologies/virtualization/oraclevm/index.html>



necessitating dedicated migration networks unless users incur the extra complexity and expense of purchasing SSL hardware;

- **Automatic VM Restart:** Detects and automatically restarts instances within the server pool after failures of physical server hardware, VM instances or MySQL. (Note that the MySQL failover is initiated by a script within the template itself that may result in a VM restart based on failure type).
- **Automatic or Manual Server Pool Load Balancing:** Guest VMs are automatically placed on the server with the most resources available in the pool at start-up, or can be started within a user-designated subset of servers.
- **Automated Network Management:** Oracle VM configures a common, virtualized system IP that is automatically bound and re-bound to physical network layers, regardless of the platform it is initially started on, thereby eliminating the manual administration effort involved with updating routing tables or network configurations.

Underpinning the HA mechanisms, Oracle VM provides:

- Powerful cluster-based network and storage heartbeat algorithms to quickly and deterministically identify failed and/or isolated servers in the server pool to ensure rapid, accurate recovery.
- Sophisticated distributed lock management functionality for SAN and iSCSI storage ensures VMs or entire servers can be rapidly restarted with no risk of data corruption.

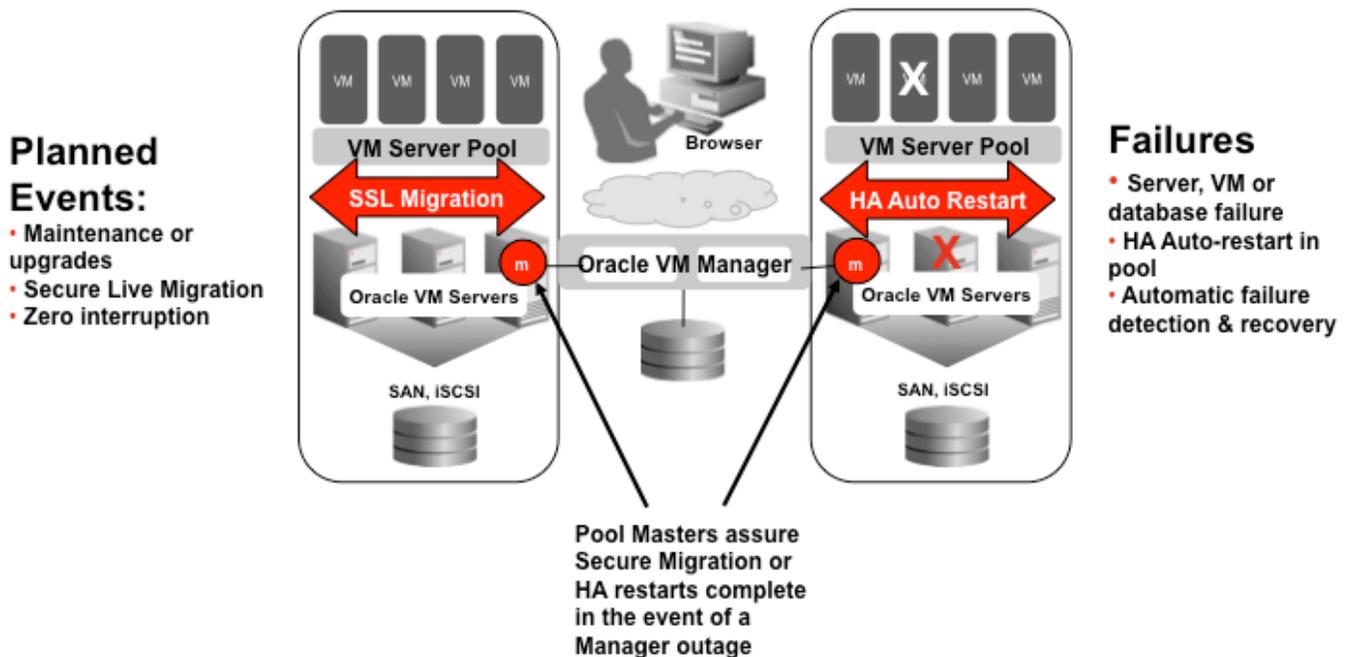


Figure 3: Delivering High Availability – Planned Events and Failures

Oracle delivers global 24 x 7 support for Oracle VM, including access to patches, fixes, and updates delivered via the Unbreakable Linux Network available to Oracle VM support subscribers.

Oracle Cluster File System 2 (OCFS2)

OCFS2⁵ is an open source, general-purpose, extent-based clustered file system that Oracle developed, contributed to the Linux community, and was accepted into the Linux kernel from the 2.6.16 release.

⁵ <http://www.oracle.com/us/technologies/linux/025995.htm>



OCFS2, an enterprise-class open source file system, delivers both high performance and high availability. It provides local file system semantics and can be used with any application to increase availability by providing a live migration and fail-over mechanism. In addition, cluster-aware applications can leverage parallel I/O (Input / Output) for higher performance.

OCFS2 is part of Oracle Linux, and Oracle VM uses OCFS2 as its cluster file system to host virtual machine images, as well as the OCFS2 heartbeat to support high availability deployments using clustering software. The OCFS2 file system can recover from failures independent of the servers themselves.

MySQL 5.5 Enterprise Edition

MySQL is the world's most popular open source database and cost-effectively delivers high performance and scalability for web-based, custom departmental and embedded applications. Some of the world's most trafficked websites such as Facebook, Google, ticketmaster, and eBay rely on MySQL for their business critical applications.

The MySQL Database is a transaction-safe, ACID compliant database with full commit, rollback, crash recovery and row level locking capabilities.

MySQL 5.5⁶ is the latest release and combines the benefits of the MySQL database and InnoDB storage engine to provide a high-powered data management solution that includes:

- InnoDB as the default database storage engine
- Improved performance and scalability to fully utilize the computing power of modern multi-core architectures across all platforms
- Improved availability
- Improved manageability and efficiency
- Improved usability
- Improved instrumentation and diagnostics

You can learn more about what's new in MySQL 5.5 by downloading the whitepaper posted at the following URL:

<http://www.mysql.com/why-mysql/white-papers/mysql-wp-whatsnew-mysql-55.php>

To ensure that users achieve the highest levels of MySQL performance, security and uptime, MySQL 5.5 Enterprise Edition⁷ is included in the Template, which provides access to MySQL Workbench, MySQL Enterprise Monitor & Query Analyzer, and MySQL Enterprise Backup (note these additional components are downloaded separately).

The Oracle VM Template for MySQL Enterprise Edition can be downloaded from <http://edelivery.oracle.com/oraclevm> for either a 30-day evaluation or full production usage, if you have subscribed to all the components included.

The Oracle VM Template for MySQL Enterprise Edition

The Oracle VM Template for MySQL Enterprise Edition is available for x86_64 platform using Oracle Linux with the Unbreakable Enterprise Kernel.

Like all other Oracle VM Templates, this template is downloaded from Oracle E-Delivery (see instructions in the Additional Resources section of the paper), and then imported into an existing Oracle VM Server installation. It is then deployed by creating VMs based on this template. When started with POWERON, the VM initiates 'run once at startup scripts' for both the Oracle VM and for MySQL. The user can customize the

⁶ <http://www.mysql.com/products/enterprise/database/>

⁷ <http://www.mysql.com/products/enterprise/>



configuration of both the VM and MySQL instance during prompts presented during installation. MySQL is started by default each time the VM is POWERON and stopped gracefully at each POWEROFF.

This pre-configured guest OS can be used directly for MySQL, and can also be customized using normal MySQL configuration commands which remain permanent for the duration of the VM configuration. A modified configuration can be saved into Golden Template Images for subsequent use in quickly creating and deploying a pre-configured and pre-installed VM + MySQL + Application stack customized for specific requirements.

The Oracle VM Template for MySQL is currently offered as a single instance database, e.g., it does not include MySQL Cluster nor is it automatically configured for MySQL Replication, both of which may be considered for future templates.

The template is based on the paravirtualized (PVM) Oracle Linux 5 Update 6 with Unbreakable Kernel (UEL). A hardware virtualized (PVHVM) template requiring underlying system platform extensions for virtualization, e.g., Intel-VT or AMD-V is currently not offered.

A pre-check executed at the time of installing the Oracle VM Server should return a line other than '0', indicating the hardware and BIOS of the host's processors directly support virtualization technologies:

```
# grep -c '(vmx|svm)' /proc/cpuinfo
```

Deploying the Oracle VM Template

To download the Oracle VM Template for MySQL Enterprise, browse to: <http://edelivery.oracle.com/oraclevm> and then follow the steps below:

- Complete your registration information (Name, Company Name, Email Address and Country) and click on the download agreement;
- Select "Oracle VM Templates" from the "Select a Product Pack" pull-down menu and click "Go";
- Select MySQL Enterprise from the list of Oracle VM Templates;
- Download and unzip the files and refer to the readme.

The steps for creating the Oracle VM environment are described in the Oracle VM Documentation⁸

The MySQL VM Template does not place any additional requirements on the Oracle VM installation, other than the space to place the template object.

Typically a user will connect once to Oracle eDelivery and download both the Oracle VM Manager and Oracle VM Server as well as one or more VM Templates. These are then usually downloaded to a local http or ftp site from where the installation can be completed.

Once Oracle VM Server is installed, you can download templates directly to the shared disk folder:
`/OVS/seed_pool`

Once un-tarred, the template can be imported for use with commands in the Oracle VM Manager GUI. Specific instructions for deploying a template are included in the documentation referenced above.

⁸ <http://www.oracle.com/technetwork/server-storage/vm/documentation/index.html>

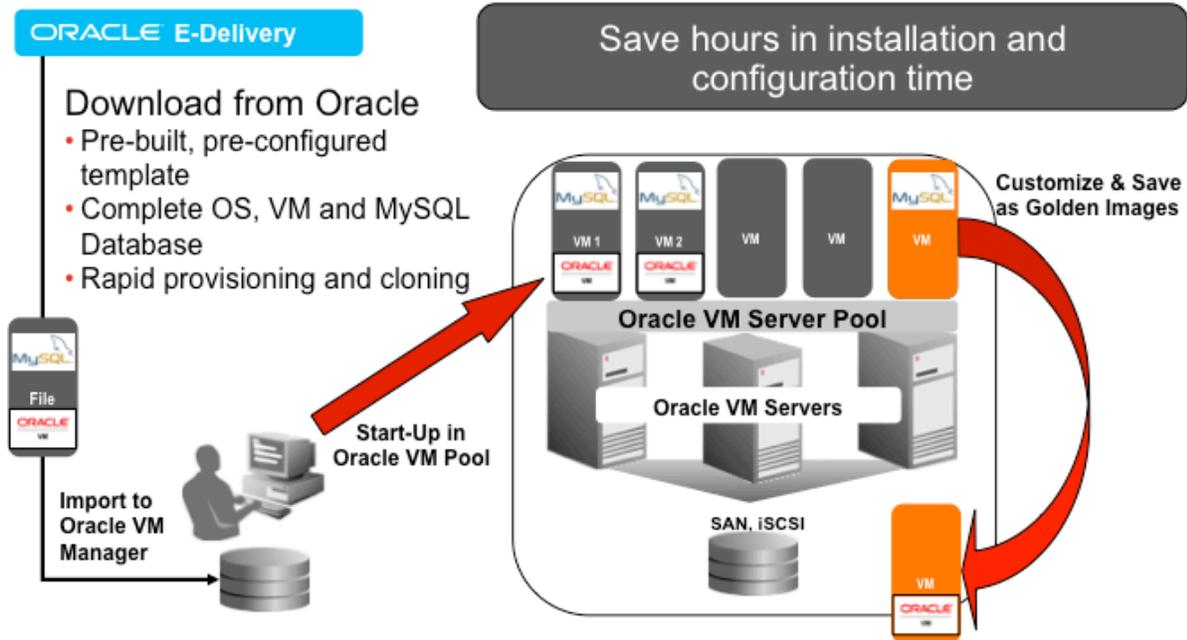


Figure 4: Rapid Database Provisioning

Using and Modifying Oracle VM Template

The Oracle VM Template for MySQL can be used to create a MySQL VM or a custom template including user-provided software, installed along with MySQL, into a complete solution stack.

To create a MySQL VM using the template, the user performs the following steps through the Oracle VM Manager (there are equivalent command line arguments, described in the Oracle VM documentation):

- 1) From the “Virtual Machines” tab select <create virtual machine>
- 2) Select “Virtual Machine based on virtual machine template”
- 3) Select server pool (note a VM is created only in one server pool, and is unique within that pool).
- 4) Select the template
 - a. OVM_OL5U6_X86_64_MYSQL5_5_10_PVM for a paravirtualized machine
- 5) Provide values for Virtual Machine Name and Console Password. Select “Enable High Availability” to activate the HA features. Select “Next”
- 6) Select “Confirm”

At this point you return to the updated list of virtual machines. The newly created VM will show status “Creating”. During this time the OVM Manager is copying the system image and configuration from /OVS/seed_pool/<selected template> to /OVS/running_pool/<VM UID> where <VM UID> is the generated identifier of the virtual machine.



You will see the randomly generated MAC address from the Network sub-configuration tab, or as a value in the vif parameter of the newly created vm.cfg file. Some systems assign a MAC address to the IP/system name as part of normal firewall protection. If there is a need to assign the MAC address, the vm.cfg file can be edited while the VM is in a stopped state.

The first time the MySQL VM is started, it is strongly recommended to start the VM domain from the “xm” command line from the Dom0 hypervisor. All first time prompts for setup are executed by this first-time script, only in this terminal environment. A user would ssh to this VM Server Dom0 as root, to perform this action, using the command below.

```
Shell> xm create /OVS/running_pool/<VM UID>/vm.cfg -c
```

<VM UID> is the VM generated name generated at the time the virtual machine was created.

The prompts are generated by first time only elements of the Oracle Linux OS and the Oracle VM environment and then the MySQL VM environment. It is here that you would follow an Oracle VM configuration for virtual disk and virtual network configurations which are specific to the started VM.

MySQL will prompt the user for additional values necessary for configuration of MySQL in this VM instance. The user is prompted with the following:

- For the port to be used for the MySQL Server network service, default 3306;
- For the initial configuration of the template {small, medium, large, extra-large, innodb-large}. These are standard mysql.cnf files defining system start-up parameters based on target configuration;
- Whether the user wants the mysqld server to be automatically started at system boot (it is installed as a Linux service, the option is automatic start or manual start);
- mysql_secure_installation script is executed at completion of initialization providing a trusted path for the user to provide the mysql system passwords and apply access controls to the MySQL database.

Note – please refer to the Readme file which is downloaded with the template for additional instructions of the installation and configuration process.

At the end of this first time startup, the user is presented with a prompt to login to the VM domain. This prompt is supported by the Dom0 Hypervisor, and is bridged to the DomU of the newly started user domain created from the named template.

Even though started from a command line, the OVM Manager GUI will show the VM as POWERED ON after its REFRESH cycle.

Special considerations at this point are:

- 1) The user can follow standard MySQL post-installation steps to customize for their specific environment:
 - a. Change the ‘root’ password;
 - b. Add users or add privileges to users;
 - c. Change any mysqld server configuration values and restart the mysql server.

Refer to the documentation for the full range of options⁹

⁹ <http://dev.mysql.com/doc/refman/5.5/en/index.html>



- 2) The VM can be controlled using the full life-cycle range of Oracle VM Manager commands, including powered-off, paused, resumed, cloned, migrated, deleted, etc

Enabling High Availability for the Oracle VM Template

When a VM is created with the “HA Enabled” options configured, the VM instance will be restarted by the Oracle VM Manager in case of any failure of the server platform, VM or virtualized network.

The mysqld recovery process is configured by the first time boot script discussed in the sections above, enabling the user to configure automatic recovery of the database(s), as defined below:

- a) process does not exist, mysqld restart via a VM restart;
- b) process exists but not listening, mysqld restarts via a VM restart;
- c) process exists, is listening but not responding, mysqld restarts via a VM restart.

A higher level of HA is provided by the domain itself, which is managed by the Oracle VM HA mechanisms that provide heartbeating and recovery. To MySQL, the automated restart managed by Oracle VM is similar to a non-VM environment. Recovery of one or more database files occurs before the service accepts new connections.

A client application connected to a MySQL Server must re-connect after the VM instance is restarted. Oracle VM provides image copying to improve both the restart time and the resiliency of data.

Capabilities & Configuration of Oracle VM HA

Users can configure High Availability in Oracle VM to guarantee the availability of guests if the Virtual Machine Server they are running on fails or is restarted as part of a live migration operation. When a Virtual Machine Server is restarted or shut down, the guests running on it are either restarted on, or migrated to, another Virtual Machine Server.

You can manage HA with Oracle VM Manager. To implement HA, you must create a server pool (a cluster of Virtual Machine Servers) and have them managed by Oracle VM Manager. HA cannot be implemented with a stand-alone Oracle VM Server.

To use HA, you must first enable HA on the server pool, then on all guests domains. If HA is not enabled for either, HA is disabled. When a Virtual Machine Server fails, the guest domain(s) are migrated or restarted on another available Virtual Machine Server. Migration is a controlled failover, where the state of the existing guest domain is copied to an alternate server and restarted at the current instruction of the migrated domain.

A Virtual Machine Server is selected using the Preferred Server setting for the server pool when you create a guest in Oracle VM Manager:

- “Auto” selects an available Virtual Machine Server, with workload balance as primary determination.
- “Manual” selects an available preferred Virtual Machine Server from a subset list of servers in the server pool only and will fail if no servers in the list are available.

If you do not select a preferred Oracle VM Server when creating a guest in Oracle VM Manager, Auto is set as the default. If there is no preferred Virtual Machine Server or Virtual Machine Server available, the guests shut down (Power Off) and are restarted when a Virtual Machine Server becomes available.

If the Server Pool Master fails, another Oracle VM Server is selected from the server pool to act as the Server Pool Master. The Oracle VM Server chosen to take over the Server Pool Master role is the first Oracle VM Server available to take the lock. To use the Server Pool Master fail over feature, you should make sure the Oracle VM Agent password is identical on all Oracle VM Servers in the server pool.



You can also dynamically change the Oracle VM Server that acts as the Server Pool Master without causing any outages.

The high availability mechanisms provided by Oracle VM are designed to protect against both planned and unplanned downtime, and behave in the following way:

- If you shut down or restart a Virtual Machine Server in Oracle VM Manager with running guest domains, you are prompted which guests to migrate to another available Virtual Machine Server. Any guests that are not migrated are restarted on an available Virtual Machine Server.
- If you shut down or restart a Virtual Machine Server at the Oracle VM Server command-line, Oracle VM Agent restarts the guests on an available Virtual Machine Server.
- If a Virtual Machine Server fails, all running guests are restarted automatically on another available Virtual Machine Server.
- If a Virtual Machine Server fails and no other Virtual Machine Servers are available, all running guests are restarted when a Virtual Machine Server becomes available.

To enable HA, you must first make sure all Virtual Machine Servers in the server pool:

- Use the same shared storage repository. This means all Oracle VM Servers in the server pool must have the same storage view. Using OCFS2-based shared storage, the OCFS2 device /dev/sdd1 must be visible on all Virtual Machine Servers.
- Are in the same cluster.
- Are Oracle VM Server Release 2.1.2 or above.

You can read more about configuring storage in the Oracle VM Server User's Guide¹⁰

The following section describes how to perform the configuration required to enable HA.

After you have created the storage repository, you must enable HA in the server pool and on guests. To enable HA:

1. Log in to Oracle VM Manager and enable HA in the server pool.

If the server pool already exists, enable HA on the server pool. If the server pool does not exist, create the server pool and enable HA when you create it. See the Oracle VM Manager User's Guide for information on setting up HA using Oracle VM Manager.

The server pool set up is verified and any errors are displayed in Oracle VM Manager. If there are no errors, the Oracle VM Agent on the Server Pool Master automatically mounts the storage repository set as the cluster root, and any other storage repositories, on each Oracle VM Server in the server pool (the cluster). When an Oracle VM Agent is started in the server pool, this propagation is repeated for that Oracle VM Server.

The shared storage and cluster is configured, and the server pool is HA enabled.

2. When creating guests (virtual machines) in Oracle VM Manager, enable HA.

HA is now enabled on the server pool and guests.

Note: The HA mechanisms will recover automatically from single failure events. Manual intervention may be required in the instance of multiple failures, i.e. if the server designated as Server Pool Manager is the only management link to the shared attached storage, the HA mechanisms can not automatically recover from server failure. This multiple error scenario can be avoided by using dual ported shared attached storage, allowing access to the file system to switch to an alternate hardware path, independent of the recovery of the Server Pool Manager on an alternate server in the server pool.

¹⁰ <http://www.oracle.com/technetwork/server-storage/vm/documentation/index.html>



Using the Oracle VM Template for MySQL in Production

For production deployments, Oracle provides around-the-clock technical support covering the entire stack, as well as additional tools & services to save time while cost-effectively improving the performance and reliability of your applications.

MySQL Enterprise Edition is included within the Template, delivering the most comprehensive set of MySQL production, backup, monitoring, modeling, development, and administration tools so organizations can achieve the highest levels of performance, security and uptime.

Customers of MySQL Enterprise Edition have access to the following offerings:

MySQL Database – The world most popular open source database for delivering high performance and scalable web based applications as well as custom enterprise and embedded applications.

MySQL Enterprise Backup – MySQL Enterprise Backup performs online “Hot” backups of your MySQL databases. You get a consistent backup copy of your database to recover your data to a precise point in time. In addition, MySQL Enterprise Backup supports creating compressed backup files, and performing backups of subsets of InnoDB tables. Compression typically reduces backup size up to 90% when compared with the size of actual database files, helping to reduce storage costs. In conjunction with the MySQL binlog, users can perform point in time recovery.

MySQL Enterprise Monitor and Query Analyzer – The MySQL Enterprise Monitor provides at-a-glance views of the health of your MySQL databases. It continuously monitors your MySQL servers and alerts you to potential problems before they impact your system. It’s like having a “virtual DBA” assistant at your side to recommend best practices and eliminate security vulnerabilities, improve replication, and optimize performance. As a result, DBAs and system administrators can manage more servers in less time and helps developers and DBAs improve application performance by monitoring queries and accurately pinpointing SQL code that is causing a slow down.

MySQL Workbench – MySQL Workbench is a unified visual tool that enables developers, DBAs, and data architects to design, develop and administer MySQL servers. MySQL Workbench provides advanced data modeling, a flexible SQL editor, and comprehensive administrative tools.

Note that these components can be downloaded from <https://edelivery.oracle.com/> where they can be evaluated for 30 days.

Oracle Premier Support for MySQL – MySQL Enterprise Edition provides 24x7x365 access to Oracle’s MySQL Support team, which is staffed by seasoned database experts ready to help with the most complex technical issues. Oracle’s Premier support provides you with:

- 24x7x365 phone and online support
- Rapid diagnosis and solution to complex issues
- Unlimited incidents
- Emergency hot fix builds
- Access to Oracle’s MySQL Knowledge Base
- Consultative support services



Oracle Unbreakable Linux Network

The Unbreakable Linux Network¹¹ is a comprehensive resource for Oracle Unbreakable Linux and Oracle VM support subscribers, and offers access to Linux software patches, updates and fixes, along with information on up2date program and support policies.

ULN subscribers will find security updates and additional bug fixes for kernel and other packages. They will also be able to download useful extra packages not included in the original distribution.

Reducing Total Cost of Ownership

Unlike competing virtualization technologies, Oracle VM has a very simple and low cost economic model. When coupled with Oracle Linux and the MySQL Enterprise Edition subscription, users are able to deploy a fully supported platform for virtualized database infrastructure, delivering compelling TCO advantages.

There are no licenses required for Oracle Linux or Oracle VM¹² (Server and Manager), eliminating expensive up-front acquisition costs.

Oracle Linux, Oracle VM and MySQL Enterprise Edition subscriptions are charged on a per-server basis, so users are free to deploy as many VMs on a physical server as they like, without having to pay license fees or subscriptions for each VM.

This ensures costs remain low, even as users consolidate more MySQL instances onto their physical hardware resource.

Conclusion

Virtualization is a key technology to enable data center efficiency and provides the foundation for cloud computing.

Integrating MySQL Enterprise Edition with Oracle VM and Oracle Linux, the Oracle VM Template for MySQL is the fastest, easiest and most reliable way to provision virtualized MySQL instances, enabling users to meet the explosive demand for deploying web-based services in a cloud with a low Total Cost of Ownership.

The Oracle VM Template for MySQL Enterprise Edition ensures rapid deployment and helps eliminate configuration efforts and risks by providing a pre-installed and pre-configured virtualized software image, taking advantage of Oracle VM's mechanisms to deliver high availability.

Together with Oracle's 24/7 world-class technical support across the entire stack, the Oracle VM template for MySQL Enterprise Edition enables you to quickly and safely deploy new web and cloud-based applications and services.

¹¹ <http://linux.oracle.com/>

¹² <http://www.oracle.com/us/corporate/pricing/els-pricelist-070592.pdf>



Additional Resources

Download the Oracle VM Template for MySQL Enterprise:

<http://edelivery.oracle.com/oraclevm>

- Complete your registration information (Name, Company Name, Email Address and Country) and click on the download agreement.
- Select "Oracle VM Templates" from the "Select a Product Pack" pull-down menu and click "Go"
- Select MySQL Enterprise from the list of Oracle VM Templates
- Download and unzip the files and refer the readme

Whitepaper - What's New in MySQL 5.5

<http://www.mysql.com/why-mysql/white-papers/mysql-wp-whatsnew-mysql-55.php>

Data sheet - Unbreakable Enterprise Kernel for Oracle Linux

<http://www.oracle.com/us/technologies/linux/unbreakable-enterprise-kernel-ds-173416.pdf>

Data Sheet - Oracle VM

<http://www.oracle.com/us/technologies/virtualization/oraclevm/026996.pdf>

White Paper - Creating and Using Oracle VM Templates

<http://www.oracle.com/us/027001.pdf>

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